

*A report card on our knowledge of earth's species*

# SOS

State of Observed Species

**International Institute for Species Exploration,  
Arizona State University in partnership with  
International Commission on Zoological  
Nomenclature, International Plant Names Index, and  
Thompson Scientific (publisher of Zoological Record)**



2008

State of Observed Species Report  
**Partner Institutions & Organizations**

International Institute for Species Exploration

Arizona State University

[www.species.asu.edu](http://www.species.asu.edu)

International Commission on Zoological Nomenclature

[www.iczn.org](http://www.iczn.org)

International Plant Names Index

[www.ipni.org](http://www.ipni.org)

Thompson Scientific

<http://scientific.thomsonreuters.com/support/products/zr/>

# Introduction

Approximately 1.8 million species have been described since the origin of modern systems for naming plants and animals in the 18<sup>th</sup> century. Each year taxonomists document thousands of additional species, steadily expanding and improving our knowledge of both living and fossil species. There are many reasons that scientists explore earth's species: to discover and document the results of evolutionary history; to learn the species that comprise the ecosystems upon which life on our planet depends; to establish baseline knowledge of the planet's species and their distributions so that non-native pests and vectors of disease may be detected; to inform and enable conservation biology and resource management. Perhaps most compelling is curiosity about the diversity of life analogous to our quest to map the stars of the Milky Way and the contours of the ocean floors.

This is the first annual State of Observed Species (SOS) Report. The International Institute for Species Exploration in partnership with the International Commission on Zoological Nomenclature, the International Plant Names Index, and Thompson Scientific (publishers of *Zoological Record*) will each year report on the growth of our knowledge of Earth's species. The SOS Report for 2008 records numbers of species described in the calendar year 2006. Because new species are described in thousands of journals, some obscure and with limited distributions, there is a significant lapse of time before many species are noted. Efforts exist to create a mandatory registration system that would assure knowledge of all newly described species but no such requirement currently exists for either the botanical or zoological codes. Numbers of newly described species are given below followed by approximate total numbers of living species described to date. Starting dates for totals vary by taxon: for plants, since 1757; for animals (except spiders) since 1758.

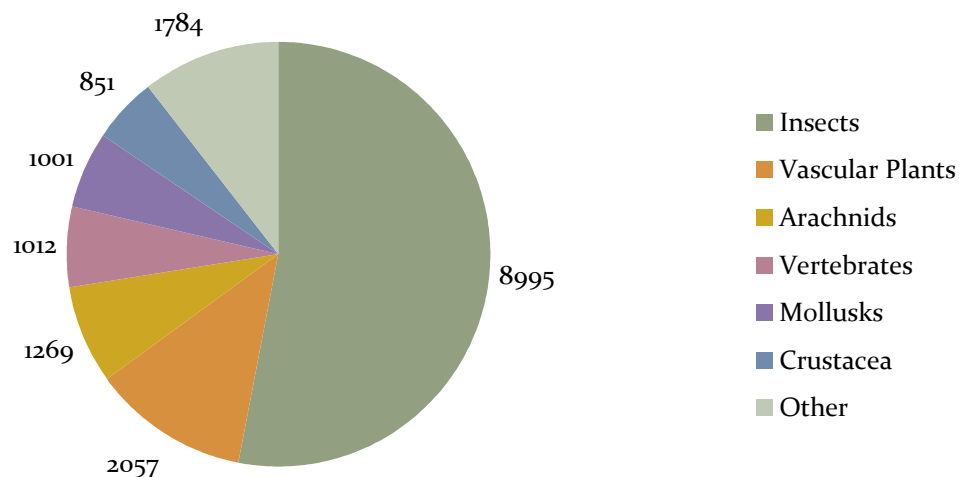
This document reports the discovery and description of 16,969 species new to science. It is important to note that this report does not yet include microbes which are among the least well known groups. It does, however, mark the progress in knowledge of major plant and animal groups.

# Species Described as New in 2006

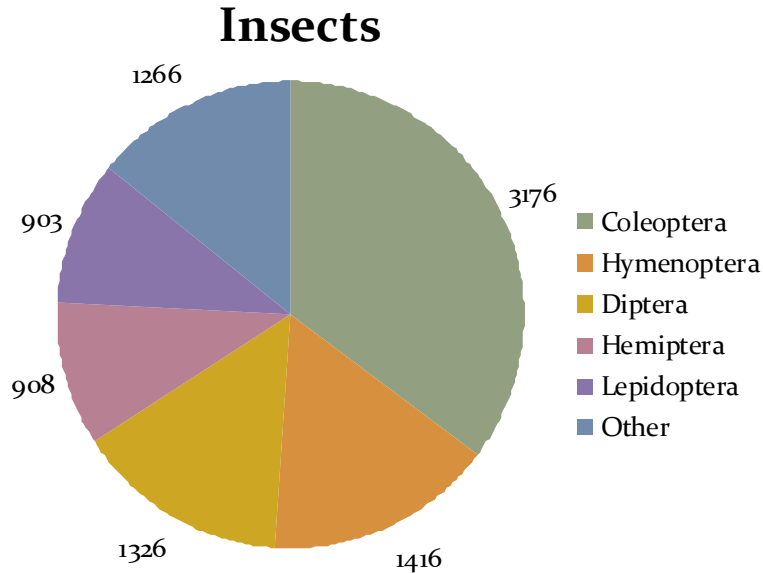
The majority of species described as new in 2006 were invertebrate animals and vascular plants. This is consistent with recent years and reflects, in part, our profound ignorance of many of the most species-rich taxa inhabiting our planet. In *The Evolution of Insects* (Cambridge Univ. Press, 2005), David Grimaldi and Michael Engel, for example, speculated that 75% of living species of insects remain undescribed, totaling perhaps 3,000,000 species. Species exploration in the insects is taking place at a comparatively brisk pace with about twice as many species described in 2006 compared with the annual average since the first insect species was described (officially) in 1758 by Carolus Linnaeus.

The “gold standard” for species description has long been the taxonomic revision or monograph - treatments in which all previously described species are critically reviewed and tested and new species described - as well as regional studies that aim for comprehensive coverage. Some of the species reported here resulted from the first large-scale grant support for species discovery and description, the Planetary Biodiversity Inventory projects of the U.S. National Science Foundation; this may account for a spike in numbers of species of some taxa such as plant bugs (<http://research.amnh.org/pbi/>), catfishes (<http://silurus.acnatsci.org/>), and plants of the genus *Solanum* including potatoes, tomatoes and relatives (<http://www.nhm.ac.uk/research-curation/projects/solanaceaesource/>).

## New Animal & Vascular Plant Species



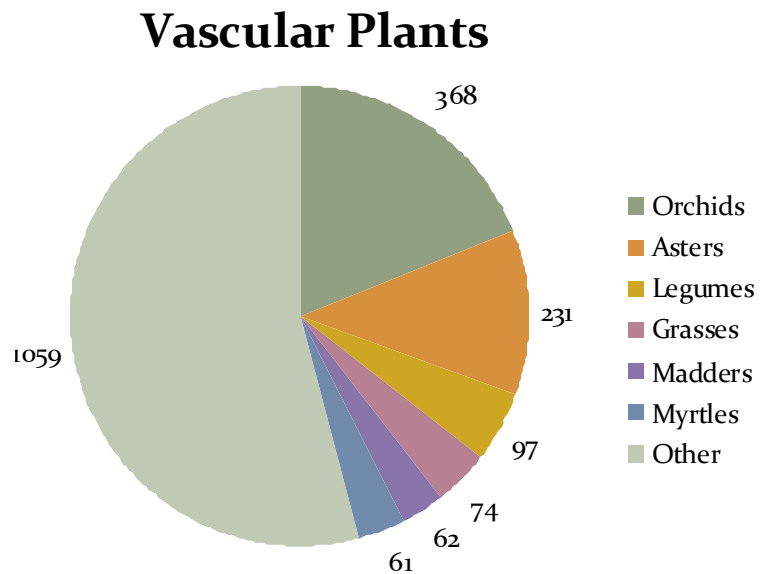
**Insects (Insecta): 8,995 new species.** Total described living species to date: ca. 950,000.



Although over 30 orders are represented by newly described insect species, the vast majority belong to just a few major orders including 3,176 (35%) Coleoptera (beetles), 1,416 (16%) Hymenoptera (wasps, ants, bees), 1,326 (15%) Diptera (flies), 908 (10%), Hemiptera (true bugs), and 903 (10%) Lepidoptera (moths and butterflies). The remaining 1,266 (14%) species belong to numerous smaller orders.

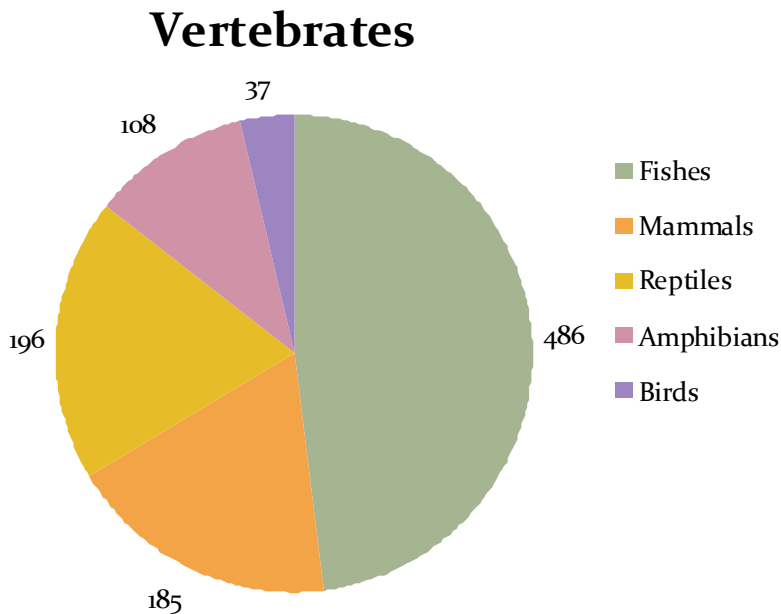
**Vascular Plants: 2,057 new species.** Total living species to date ca. 270,000.

Of the new species, 1,952 (95%) are flowering plants (angiosperms). Within the angiosperms a handful of families account for almost half of the newly described species: 368 (18%) are Orchidaceae (orchid family), 231 (11%) are Asteraceae (sunflower family), 97 (5%) are Leguminosae (the pea family or legumes), 74 (4%) are Poaceae (grasses), 62 (3%) are Rubiaceae (madder family), and 61 (3%) are Myrtaceae (myrtle family).



**Arachnida (spiders, ticks, scorpions and relatives):**  
**1,269 new species.** Total living species to date ca. 70,000.

**Vertebrata (vertebrates): 1,012 new species.** Total living species to date ca. 58,800.



Of the new species, 486 are fishes (total living species to date ca. 29,300), 185 are mammals (total ca. 5,400), 196 are reptiles (total ca. 8,240), 108 are amphibians (total ca. 5,900), and 37 are birds (total ca. 9,900). Numbers for most of the land vertebrate groups are somewhat misleading as most of the newly described species are fossils. For example, living species account for less than 60% of the new reptile species, about 25% of new mammal species, and less than one fifth of new bird species.

**Mollusca (mollusks; snails, clams, squid and relatives):**  
**1,001 new species.** Total number of living species ca. 70,000.

**Crustacea (crustaceans; crabs, lobsters, barnacles, shrimp and relatives): 851 new species.** Total number of living species ca. 40,000.

**Platyhelminthes (flatworms): 291 new species.** Total number of living species ca. 25,000.

**Nematoda (round worms): 264 new species.** Total number of living species ca. 80,000.

**Bryozoa (moss animals): 235 new species.** Total number of living species ca. 5,000.

**Annelida (segmented worms): 127 new species.** Total number of living species ca. 12,000.

**Echinodermata (sea urchins, starfishes, sea cucumbers and relatives): 124 new species.** Total number of living species ca. 7,000.

**Cnidaria (corals, sea anemones, jellyfishes, hydra and relatives): 102 new species.** Total number of living species ca. 9,000.

**Other animals: 641 new species.**

# FREQUENTLY ASKED QUESTIONS

**What is a new species?** These are species newly known to science. In many cases specimens have been discovered in the field for the first time. In other cases specimens have existed in museums or herbaria for many years and have only now been recognized as new.

**Are described species permanent?** Yes, in a sense. All validly described species names remain available permanently. It is important to note that species, however, are scientific hypotheses and are subject to rejection with the addition of new data. Thus, some species recognized today may eventually be found to consist of several species. Alternatively, some may be found to actually be the same as some previously known species. There are internationally accepted rules that determine the correct name when such circumstances arise.

**Who gets to name new species?** Anyone complying with the international codes of botanical or zoological nomenclature may describe and name new species.

**Why are museums and herbaria important to new species documentation?** Natural history collections play a very special role in the documentation of species. Type specimens serve as a kind of international standard for scientific names. They are cared for permanently in such collections and may be referred to any time that the application of a name is in doubt. Second, collections house large series of specimens collected in many places and times that allow scientists to study variation within and between species.

**Who are the scientists who primarily explore for new species?** In general they are known as taxonomists. Within taxonomy, however, are many specialties. An entomologist studies insects, a botanist plants, and so forth. There are also many subspecialties such as a coleopterist (a beetle expert) or dipterist (a fly expert).

**What is the significance of May 23<sup>rd</sup>?** The SOS Report is issued each year on May 23, the birth date of Carolus Linnaeus, the father of modern taxonomy.